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UNIVERSITI SAINS MALAYSIA

First Semester Examination
2016/2017 Academic Session

December 2016 / January 2017

EEE 320/3 – MICROPROCESSOR II

[MIKROPEMPROSES II]

Duration : 2 hours
[Masa : 2 jam]

Please check that this examination paper consists of **NINE (9)** pages of printed material before you begin the examination. English version from page **TWO (2)** to page **FIVE (5)** and Malay version from page **SIX (6)** to page **NINE (9)**.

*Sila pastikan bahawa kertas peperiksaan ini mengandungi **SEMBILAN (9)** muka surat bercetak sebelum anda memulakan peperiksaan ini. Versi Bahasa Inggeris daripada muka surat **DUA (2)** sehingga muka surat **LIMA (5)** dan versi Bahasa Melayu daripada muka surat **ENAM (6)** sehingga muka surat **SEMBILAN (9)**.*

Instructions: This question paper consists of **FOUR (4)** questions. Answer **THREE (3)** questions. All questions carry the same marks.
*[**Arahan:** Kertas soalan ini mengandungi **EMPAT (4)** soalan. Jawab **TIGA (3)** soalan. Semua soalan membawa jumlah markah yang sama]*

Answer to any question must start on a new page
[Mulakan jawapan anda untuk setiap soalan pada muka surat yang baharu].

"In the event of any discrepancies, the English version shall be used".
[Sekiranya terdapat sebarang percanggahan pada soalan peperiksaan, versi Bahasa Inggeris hendaklah diguna pakai].

ENGLISH VERSION

1. (a) Identify the default segment register assigned to the following.
   (i) SP
   (ii) EBX
   (iii) DI
   (iv) EBP
   (v) SI

   (20 marks)

   (b) Explain what happens when PUSH BX instruction executes. Make sure to show where BH and BL are stored in both physical and logical address. (Assume that SP = 0100H and SS = 0200H)

   (40 marks)

   (c) Suppose that DS = 0200H, BX =0300H and DI = 0400H. Determine the address accessed by each of the following instruction
   (i) MOV AL,[1234H]
   (ii) MOV EAX,[BX]
   (iii) MOV [DI],AL

   (40 marks)

2. (a) Show which JMP instruction assembles (short, near or far) if the JMP THERE instruction is stored address 10000H and the address THERE is;
   (i) 10020H
   (ii) 11000H
   (iii) 0FFFEH
   (iv) 30000H

   (30 marks)

   (b) If an instruction that needs to be fetched is in physical memory location 389F2H. If CS = 2700H, does the segment range include it (physical memory location). If not, value should be assigned to CS if the IP must be 1282H?

   (30 marks)

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(c) In some applications it is common practice to save all registers at the beginning of a subroutine. Assume that SP = 1288H before a subroutine CALL. Show the contents of the stack pointer and the exactly memory contents of the stack after PUSH F for the following

```
1132:0450       CALL PROC1
1132:0453       INC BX
PROC1   PROC
        PUSH AX
        PUSH BX
        PUSH CX
        PUSH DX
        PUSH SI
        PUSH DI
        PUSH F

PROC1   ENDP
```

(40 marks)

3. (a) State and explain the processor modes in ARM7 TDMI.

(30 marks)

(b) Consider the following example and determine in which processor mode the system is running:

(i) Under normal circumstance, the processor is happily executing the code.

(ii) Not much activity happens (aside from polling) until either a signal comes in or the user has pressed a key.

(iii) The machine is about to loose power in a few milliseconds. A message should be sent to user to inform the situation.

(iv) The processor sees an instruction in the pipeline that it does not recognize.

(20 marks)

(c) Describe the difference of interrupt execution in ARM7 compared to any other microprocessor.

(30 marks)

(d) What is the standard use of register r14, R13 and r15?

(20 marks)

4. (a) Explain and Calculate the effective address of the following instruction if register r3 =004000 and register r4 = 0020:
LDR r7, [r3], r4

(15 marks)

(b) Suppose that we had a register containing a binary value that needed to be normalized. In other words, we need to have the leading 1 in the most significant bit even if we have to shift it to get there. We also should record how many times we have shifted the value.

(i) Draw a flowchart for the normalization algorithm

(ii) Write an assembly language to perform the operation

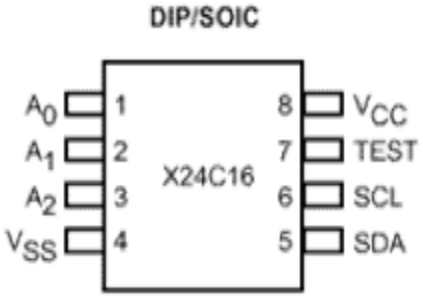
(40 marks)

(c) Figure 4 shows three different devices with different communication protocol.

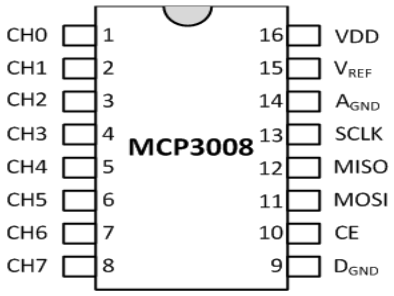
(i) State the communication protocol for each device

(ii) Explain the communication protocol for each device

(45 marks)



(a)



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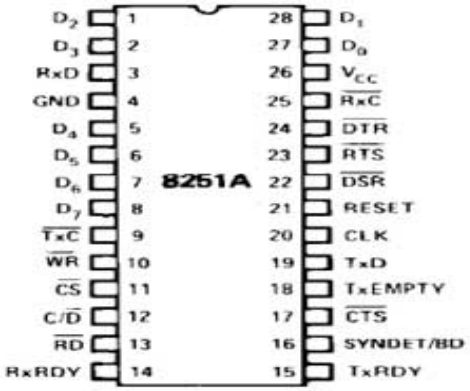

(c)

Figure 4: Three different devices with different communication protocol

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VERSI BAHASA MELAYU

1. (a) *Tentukan segmen daftar lalai yang telah ditugaskan seperti dibawah.*

   (i) SP

   (ii) EBX

   (iii) DI

   (iv) EBP

   (v) SI

   (20 markah)

   (b) *Terangkan apa yang berlaku apabila arahan PUSH BX dilaksanakan. Pastikan untuk menunjukkan di mana BH dan BL disimpan di kedua-dua alamat fizikal dan logik. (Andaikan SP = 0100H dan SS = 0200H)*

   (40 markah)

   (c) *Katakan DS = 0200H, BX = 0300H dan DI = 0400H. Tentukan alamat yang dicapai oleh setiap arahan berikut*

   (i) MOV AL,[1234H]

   (ii) MOV EAX,[BX]

   (iii) MOV [DI],AL

   (40 markah)

2. (a) *Tunjukkan yang mana arahan JMP berkaitan (pendek, dekat atau jauh) jika JMP THERE arahan disimpan address 10000H dan alamat THERE adalah;*

   (i) 10020H

   (ii) 11000H

   (iii) 0FFFEH

   (iv) 30000H

   (30 markah)

(b) *Jika arahan yang perlu diambil adalah di lokasi memori fizikal 389F2H. Sekiranya CS = 2700H, adakah julat segmen akan termasuk didalamnya (lokasi memori fizikal). Jika tidak, nilai apakah perlu diberikan kepada CS jika IP mesti mengandungi 1282H?*

(30 markah)

(c) *Dalam beberapa aplikasi ia adalah amalan biasa untuk menyelamatkan semua daftar pada awal subrutin. Andaikan SP = 1288H sebelum CALL subrutin. Tunjukkan kandungan penunjuk timbunan dan kandungan sebenar memori timbunan selepas PUSH F untuk yang berikut*

```
1132:0450       CALL PROC1
1132:0453       INC BX
PROC1   PROC
        PUSH AX
        PUSH BX
        PUSH CX
        PUSH DX
        PUSH SI
        PUSH DI
        PUSH F

PROC1   ENDP
```

(40 markah)

3. (a) *Nyatakan dan terangkan mod-mod pemproses dalam ARM7 TDMI*

(30 markah)

(b) *Pertimbangkan contoh-contoh berikut dan tentukan mod pemproses yang manakah sedang digunakan oleh pemproses:*

(i) dalam keadaan normal, pemproses sedang melaksanakan program dengan jayanya.

(ii) Tidak banyak aktiviti yang berlaku (selain daripada polling) sehingga samada isyarat masuk ataupun pengguna menekan kekunci.

(iii) mesin tersebut akan kehilangan kuasa dalam beberapa millisecond. Satu pesanan akan dihantar untuk memberitahu pengguna tentang situasi ini.

(iv) Pemproses melihat terdapat satu arahan dalam pipeline yang ia tidak kenal.

(20 markah)

(c) *Terangkan perbezaan perlaksanaan sampukan dalam ARM7 berbanding dengan mikropemproses yang lain.*

(30 markah)

(d) *Apakah kegunaan lazim untuk pendaftar r14, r13 dan r15?*

(20 markah)

4. (a) *Terangkan dan kirakan alamat yang berkesan bagi arahan berikut jika pendaftar r3 = 004000 dan pendaftar r4=0020:*

LDR r7, [r3], r4

(15 markah)

(b) *Sekiranya kita mempunyai pendaftar yang mengandungi nilai binari yang perlu dinormalisasikan. Dalam kata lain, kita perlu ada logi 1 pada permulaan dalam bit paling berkesan walaupun kita perlu anjak untuk mendapatkannya. Kita juga perlu rekod berapa kali kita sudah menganjakkan data tersebut.*

(i) Lukis carta alir untuk algorithma normalisasi tersebut

(ii) Tulis bahasa penghimpun untuk melaksanakan operasi tersebut

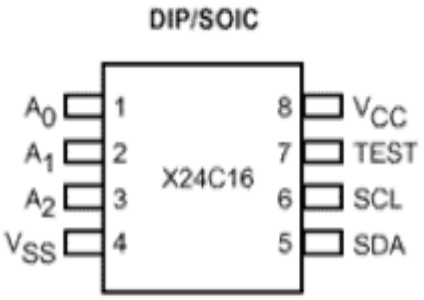
(40 markah)

(c) *Rajah 4 menunjukkan tiga peranti yang berbeza dengan protokol komunikasi yang berbeza.*

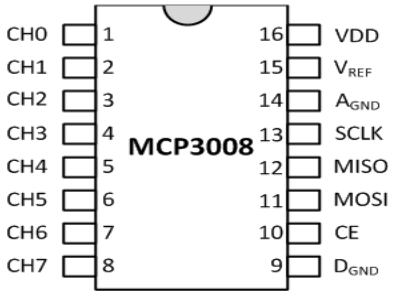
(i) Nyatakan protokol komunikasi untuk setiap peranti

(ii) Terangkan protokol komunikasi untuk setiap peranti

(45 markah)



(a)



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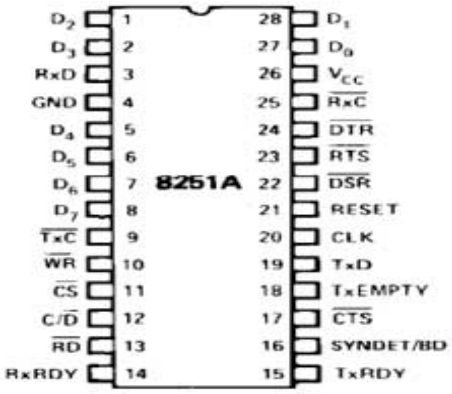

(c)

Rajah 4: Tiga peranti yang berbeza dengan protokol komunikasi yang berbeza

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